PART ONE

The Basics

CHAPTER 1

The Basics

The word *option* has come to mean many things beyond a financial instrument. The meaning includes the concept of choices or alternatives. In our context that's appropriate because at the heart of an option is the fact that owners of options have a clear choice. They have the right to do something, but no obligation to do anything, once they've paid for the option. It's this freedom, this choice, and this luxury of waiting that result in the unusual risk/reward profile for an option. The most that option owners can lose is the cost of the option. The amount that option owners can make is literally infinite in the case of a call option. On the other hand, the seller of an option has no choices other than the choice to reenter the market and repurchase the option, paying whatever the market demands.

Add to this element of choice the impact of an option being a wasting asset, since it will expire at some point, and we are left with a wonderfully nuanced instrument. All of these factors and others, such as the date of expiration as well as the price we'd pay or receive for the underlying asset, go into the calculus of considerations that is option trading.

OPTION SPECIFICS

A *call option*, often just referred to as a *call*, gives its owner the right to buy something. A *put* option, often referred to simply as a *put*, gives its owner the right to sell something. It's an oversimplification in the extreme but instructive to say that if you think the price of something is going higher,

you'd buy a call option on that something. If you think the price of something is going lower, you'd buy a put option on that something.

The "something" in our simple example is the *underlying asset* (often simply referred to as the *underlying*). It is the asset or instrument that the owner of the call option has the right to buy. It is the asset or instrument that the owner of the put option has the right to sell. It's fixed for the term of the option although its price or value might well change during that term. That potential for change in price is one of the reasons we use options.

For an option, the price you'd pay or receive for the underlying asset is predetermined and standardized. This predetermined price, the price that you'd pay for the underlying asset if exercising a call option or that you'd receive for selling the underlying asset if exercising a put option, is the *strike price*, sometimes referred to as the *exercise price*.

Each option has an expiration date. Technically, the expiration date is usually the Saturday after the third Friday of the expiration month, that third Friday being the last trading day. Effectively, that last trading day is the last day for you to determine whether or not you're going to exercise your option.

Some will recognize that the occasional option will have a final trading day that is other than the third Friday of the month. For example, weekly options are listed that trade for one week and then expire on Friday. The result is a series of expirations each and every Friday. Quarterly options expire on the last business day of the quarter regardless of what day of the week that is. Some index options, such as options on the Standard & Poors (S&P) 500 Index (i.e., SPX options), expire on the open of trading on that third Friday. Options on the Chicago Board Options Exchange Volatility Index (VIX) settle on Wednesday. But the vast majority of individual equity and exchange traded fund (ETF) options follow the normal pattern; the last trading day is the third Friday. And why did the exchanges pick a convoluted day like the third Friday of the month as the typical final trading day rather than something simple like the last day of the month? Because they pored over the calendar and determined the third Friday would have the fewest conflicts with holidays and such. In option trading there is a reason or mathematical basis for everything even if it's not readily apparent. This includes the selection of the day for expiration.

DESCRIBING AN OPTION

We can fully describe any specific option using just these details:

- Underlying asset
- Put or call

- Expiration date
- Strike price

For example, describing an option as the "SPY March 150 call" tells us all we need to know. We have fully described the option and there is no confusion about the specific option we're discussing. The underlying is the S&P 500 Index ETF (SPY). It's a call option so it's an option to buy SPY. The last trading day of this option is the third Friday in March (if we don't mention a specific year then it's assumed to be March of this year or March of next year if the third Friday in March of this year has already passed) and it expires the next day. Finally, the strike price is 150. If owners of the option choose to exercise it, then they'll buy SPY at $150 a share regardless of where SPY is at the time.

By convention for equities and ETFs, each option controls 100 shares of the underlying. A single SPY March 150 call option gives the owner of the option the right, but not the obligation, to pay $150 for each of 100 shares of SPY on or before the third Friday in March.

Most options allow the owner to exercise the option on or before the last trading day. However, some options only allow the owner to exercise the option on the last trading day. These options are rare when talking about options on individual equities, almost every one of which has the freedom to be exercised at any time. These options that provide the freedom to be exercised at any time are American-style options (think American-style for more freedom). The options that can only be exercised on the last trading day are European-style options. As you might imagine, European-style options (which can only be exercised on the last trading day) are more common in Europe. A few European-style options trade in the United States, and SPX options (when referring to SPX options we're always referring to options on the S&P Index, not on SPX Corporation) are easily the most popular European-style option in the United States.

OPTION COST AND VALUE

The price of an option is determined by the marketplace. Potential buyers and sellers will meet, generally electronically, and determine what an option is worth, with supply and demand being the invisible hand that results in a price acceptable to buyer and seller. For an option, this price is referred to as the *premium*. The option buyer pays the premium to the option seller, and the seller gets to keep this premium regardless of what happens in the future. Sellers may end up sustaining a loss when they pay more than they initially received in order to buy back the option they had sold,

but they keep the initial premium they received. Option premium is quoted in dollars per underlying share of stock. Since the standard option contract covers 100 shares, the total an option buyer would be out of pocket if they paid $2.25 in premium for a call option would be $225.

That premium has two elements. The first element is the *inherent* or *intrinsic value*. The second, the value of being able to wait to make a decision and to get more information as time passes, is the *time value*.

Inherent Value

The inherent or intrinsic value is how much you'd get immediately if you exercised your option and then immediately closed your stock position by selling or buying your stock. For a call option the inherent value is the amount by which the strike price of the call option is below the market price of the underlying, as you can see in Figure 1.1.

If the underlying is at $40 then the 30 call is inherently worth $10.

Inherent value for a put option is the amount by which the strike price of a put option is above the market price of the underlying, as you can see in Figure 1.2.

If the underlying is at $40 the 45 put is inherently worth $5.

It's entirely possible for an option to have zero inherent value. If the strike price of a call option is above the current market price for the underlying asset, then the call has no inherent value and its entire price is derived from the luxury of having time on your side.

If the strike price of a put option is below the current market price of the stock, then the put has no inherent value.

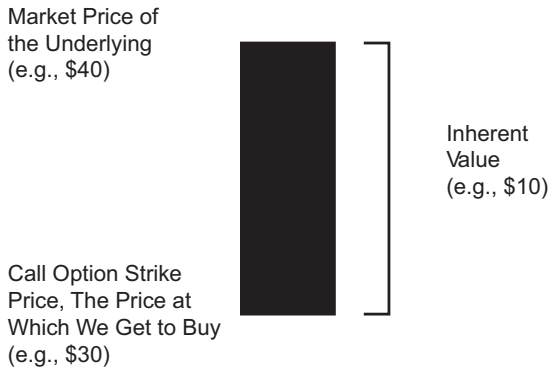

FIGURE 1.1 Call Option Inherent Value

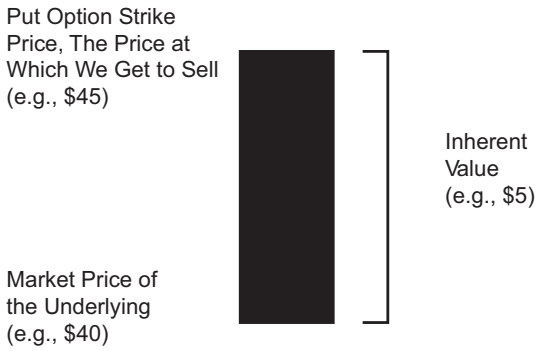

FIGURE 1.2 Put Option Inherent Value

Time Value

The time value of an option is the portion of the option price that you're willing to pay for the luxury of waiting to make a decision or to see what happens in the future. It is an option's entire price exclusive of the inherent value.

It's entirely possible for an option to have zero time value. If the strike price of our call option is hugely above the current price of the underlying and our option expires very soon, then the option will have no time value. The likelihood of the option being profitable is so infinitesimal that no one is willing to pay anything for it; there's no point in waiting for something that's never going to happen. No one would be willing to buy this call option because it provides no luxury of waiting.

Likewise, it's possible for a put option to have zero time value. If the strike price of a put, the price as which the put owner would get to sell the underlying asset, is so far below the current market price for the asset that there's essentially zero chance that the underlying will drop that low, then no one would be willing to pay anything for that option, particularly if it's due to expire soon.

An option's price is always the sum of its inherent value and its time value, as you can see in Figure 1.3, which shows that the combination of inherent value and time value equals the total value of a call option.

Figure 1.4 shows that the combination of inherent value and time value equals the total value of a put option.

If a stock is trading at $100, then how much is the 90 call option worth? Assuming you could exercise the option immediately, it's worth at least $10 because that's the inherent value of the option. But would you also be willing to pay a little bit more for the luxury of waiting a little longer

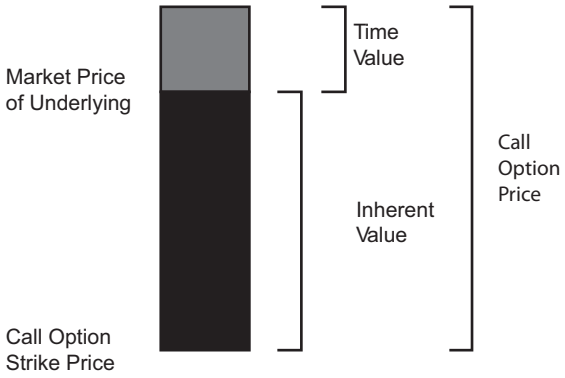

FIGURE 1.3 Call Option Price, Time Value, and Inherent Value

in order to make a better informed decision? Would you be willing to pay an extra $2 to see if the stock goes up while only risking the cost of your option rather than paying $100 for the stock and risking that entire $100? Figure 1.5 shows this combination of inherent and time value.

If we paid $12 for the 90 call with the stock at $100, then we'd be buying an option with $10 of inherent value and $2 of time value. Why would we do that versus just buying the stock at $100? Just buying the stock saves us the $2 in time value. But that might be an expensive $2. If the stock rallies to $150 at expiration, then we'll exercise our 90 call. We'd pay $90 (the exercise price of our call option) for the stock. We paid $12 for our option. Our total outlay is $102. We have a profit of $48. If we'd just bought the stock at $100 then our total outlay would be just the $100 we paid for our stock. Our profit would be $50. We're $2 ahead by just buying the stock.

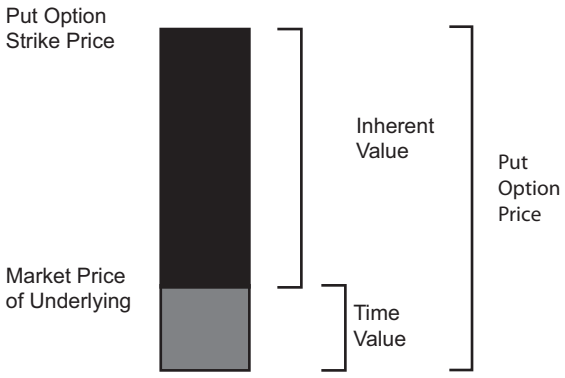

FIGURE 1.4 Put Option Price, Time Value, and Inherent Value

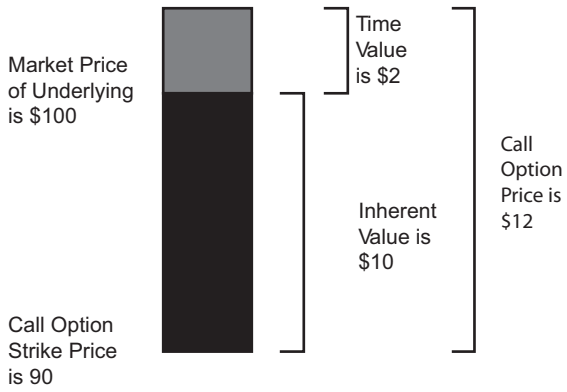

FIGURE 1.5 Call Option Price Components Example

But what if the stock drops to $50? With the option we get the luxury of choosing, and we choose not to buy the stock at $90 (our exercise price). Our option expires worthless and we've lost the $12 we paid. But if we'd tried to save that $2 in time value by buying the stock? Then we've lost $50, $38 more than the option trade, all to save $2.

Let's look at another hypothetical stock and some options on that stock to learn a little more about inherent value and time value. The hypothetical option is a call option with a strike price of 100.

As we see from Table 1.1, the price of each option is the sum of inherent value and time value. Also, inherent value is zero for call options unless the stock price is above the strike price. Once that happens the inherent value becomes linear; it increases in lockstep with the underlying.

If the stock price is below the strike price the inherent value is zero. Inherent value can never be less than zero. Figure 1.6 shows that inherent value is zero for a call option until the market price of the underlying rises above the strike price.

TABLE 1.1 Option Price Components

Stock Price	100 Call Option Price	100 Call Option Inherent Value	100 Call Option Time Value
25	0.00	0.00	0.00
50	0.50	0.00	0.50
75	1.00	0.00	1.00
100	10.00	0.00	10.00
125	26.00	25.00	1.00
150	50.50	50.00	0.50
175	75.00	75.00	0.00

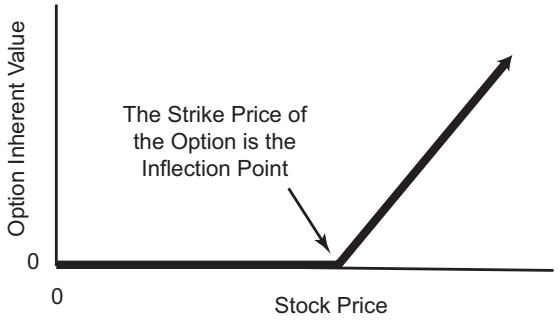

FIGURE 1.6 Call Option Inherent Value Line

HOW TIME VALUE CHANGES

As we see in Table 1.1, with the stock price equal to the strike price there is no inherent value and all of the option's value comes purely from the luxury of being able to wait to make a decision. The time value tails off in both directions as the strike price moves further away from the market price of the underlying. That makes sense. There's not much luxury in being able to wait for a stock currently at $100 to move to $150 because the likelihood of that move is pretty remote. A move from $100 down to $50 is pretty remote as well, so there's not much luxury in waiting to see if our stock drops that much.

The result is that time value is greatest for the strike price that is equal to the current market price, and then time value trails off more or less symmetrically in both directions, as seen in Figure 1.7. In practice, the curve of

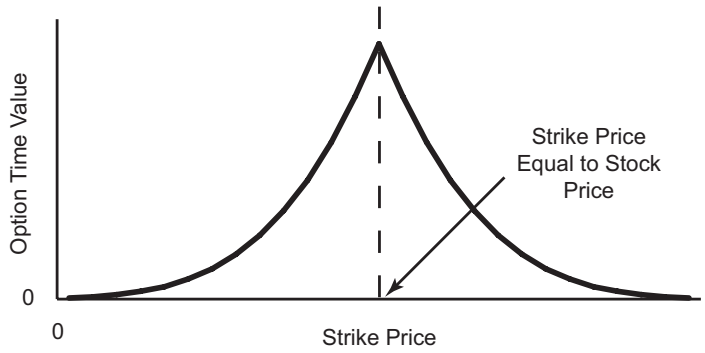

FIGURE 1.7 How Time Value Changes by Strike Price

time value will not be strictly symmetrical as hedging activity changes its shape. We'll discuss this phenomenon more fully in Chapter 6.

The height of the peak, the time value for the option with a strike price equal to the price of the underlying asset, will move up and down depending on how much the market demands for those options, but this general shape will hold for all options.

Now we know how time value changes with strike price. How does time value change with expiration date? Having more time, more luxury of being able to wait and to get more information—even if it's just the information telling us what the stock price is at the end of the month—is obviously more valuable than having less time, but the value of this time isn't always equal. If you have to make a decision in the next five minutes then the value of an extra day might be very high. On the other hand, if you have to make a decision in the next 10 years, then there's probably not much value to an extra day.

Figure 1.8 shows how time value changes by time to expiration. For each expiration date, the general shape we saw in Figure 1.7 applies; time value is greatest for the at-the-money option. However, now the curves have different shapes. The shorter-dated curve is more bowed because one extra day is pretty valuable if you only have five to go—but only if the strike price of our option is close enough to the stock price, that is, if it's close enough to at-the-money. If our stock is at $100 and our 100 strike price call option only has 5 days to expiration then each day is pretty valuable. But if our stock is at $100, then an additional day for the 50 strike price put option isn't worth very much with only five days to expiration.

Those 5-day options are moving rapidly to match their inherent value (which may be zero) as time value erodes away. The longer-dated option line is less bowed. An extra day isn't worth as much if you have 90 days left

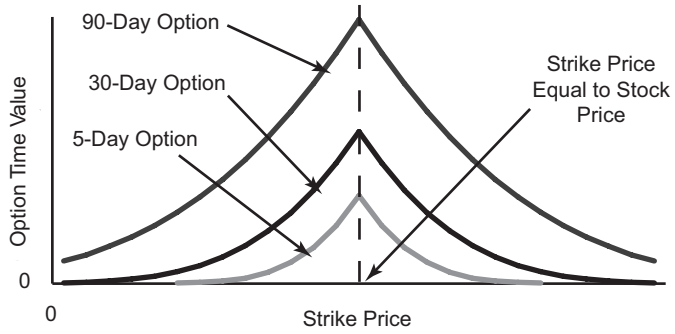

FIGURE 1.8 How Time Value Changes by Expiration

anyway, but there's still some value in seeing if our stock currently at $100 might fall to $50 sometime in the next 90 days.

Observant readers will notice that the 30-day option isn't 6 times more expensive than the 5-day option, that the 90-day option isn't 3 times more expensive than the 30-day option, and that the 90-day option isn't 18 times more expensive than the 5-day option. We'll discuss this phenomenon in Chapter 7 when we discuss time decay.

DOING THE SAME FOR PUTS

Too often books on options focus on calls because they're considered easier to understand, but this is intellectually lazy and a disservice to readers as well, because the result is that new traders focus on calls to the exclusion of puts.

Don't fall into this trap of ignoring puts because you think they're backward. Many phenomena that we'll discuss manifest themselves most acutely in put options. *Skew*, which we'll discuss in Chapter 6, is a perfect example of an option phenomenon that is most obvious in put options and that is incredibly powerful.

To make sure we don't fall into this trap, let's look at the same hypothetical stock but look at its put options this time in order to learn a little more about inherent value and time value and about the symmetry of call and put options. The hypothetical option is a put option this time, but it still has a strike price of $100.

As we see from Table 1.2, the inherent value for a put option is zero unless the stock price is below the strike price. Once that happens the inherent value becomes linear until the stock price falls to zero, at which point the inherent value has reached its maximum value, as we see in

TABLE 1.2 Put Option Price Components

Stock Price	100 Put Option Price	100 Put Option Inherent Value	100 Put Option Time Value
25	75.00	75.00	0.00
50	50.50	50.00	0.50
75	26.00	25.00	1.00
100	10.00	0.00	10.00
125	1.00	0.00	1.00
150	0.50	0.00	0.50
175	0.00	0.00	0.00

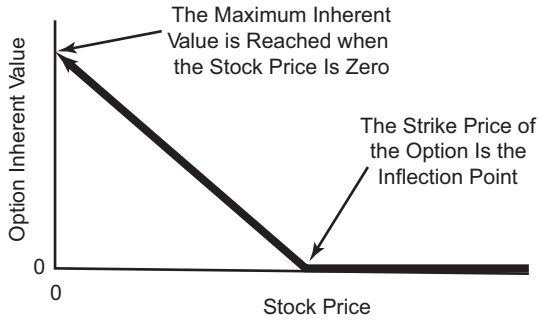

FIGURE 1.9 Put Option Inherent Value Line

Figure 1.9. This makes sense because the price of the underlying stock can't fall below zero, as we also see in Figure 1.9.

The same relationships hold for the puts and the calls, and the time value for the 75 calls ($1.00) equals the time value for the same strike puts (the 75 strike put's time value is $1.00). The time value for the 150 puts ($0.50) equals the time value for the call with the same strike (150 strike call option time value is $0.50). This symmetry between puts and calls with the same strike and same expiration date will always hold for American-style options. If you think you've found a situation where it doesn't hold, then the effect of dividends or the cost of money, or both, is at work.

MONEYNESS

Earlier we discussed the 90 call when the underlying stock was at $100. We also discussed 75 calls and 125 puts with the theoretical stock price at $100. All of these options would have inherent value. As such, option traders will say they are *in-the-money*. This simply means they have inherent value.

We also mentioned the 100 call with stock at $100. Option traders refer to this option as *at-the-money* because the strike price is equal to the price of the underlying.

If an option is not in-the-money or at-the-money, it is *out-of-the-money*. If a call's strike price, the price at which the call owner can purchase the underlying asset, is above the current price of the underlying asset, the call option is said to be out-of-the-money. Likewise, if a put's strike price, the price at which the put owner can sell the underlying asset, is below the current price of the underlying asset, the put option is said to be out-of-the-money. At-the-money and out-of-the-money options have no inherent

The Relationship of the Strike Price to the Underlying Asset

	Call Options	Put Options
In-the-Money Option	The strike price is below the price of the underlying	The strike price is above the price of the underlying
At-the-Money Option	The strike price is equal to (or very nearly so) the price of the underlying	The strike price is equal to (or very nearly so) the price of the underlying
Out-of-the-Money Option	The strike price is above the price of the underlying	The strike price is below the price of the underlying

FIGURE 1.10 Moneyness

value. All of their value is derived from time, from the luxury of being able to wait.

The strike price doesn't have to be precisely equal to the price of the underlying for an option to be at-the-money, close is usually good enough. Since it's rare for an underlying price to be precisely equal to a strike price, most professionals consider the out-of-the-money call option with the lowest strike price to be the at-the-money call option. They likewise consider the out-of-the-money put option with the highest strike price to be the at-the-money put option.

This relationship between underlying price and strike price is called *moneyness*. Figure 1.10 describes moneyness for all call and put options.

TAKEAWAYS

- An option can be fully described with just four details:
  1. the underlying asset (or security)
  2. the type (is it a put or a call)
  3. the expiration date
  4. the strike price.
- Most individual equity and exchange traded fund (ETF) options are American-style, meaning they can be exercised at any time. Some index options are European-style, meaning they can only be exercised on the last trading day. Assuming an option is one or the other and being wrong about it isn't usually a tragedy unless the options are deep in-the-money. If you're not sure, ask.

- Time value is what an option is all about. It's the price an option buyer pays for being able to make a better informed decision later.
- Time value changes. It declines as expiration approaches, but the decline isn't linear; smart option traders will use this to their advantage.
- Moneyness describes the relationship between the strike price of the option and the market price of the underlying stock. If the strike price of a put option is above the market price of the underlying, the put option is said to be in-the-money. If the strike price of a call option is below the market price of the underlying the call option is in-the-money.